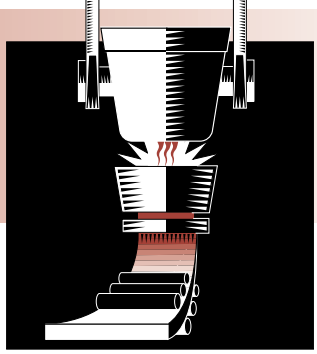
STEEL

Project Fact Sheet



Development of an O_2-Enriched Furnace System for Reduced O_2 and NO_2 Emissions

Benefits

- A burner and combustion technology that produces lower CO_2 and NO_x emissions
- Reduced scaling
- Estimated energy savings of 25-to-30 percent

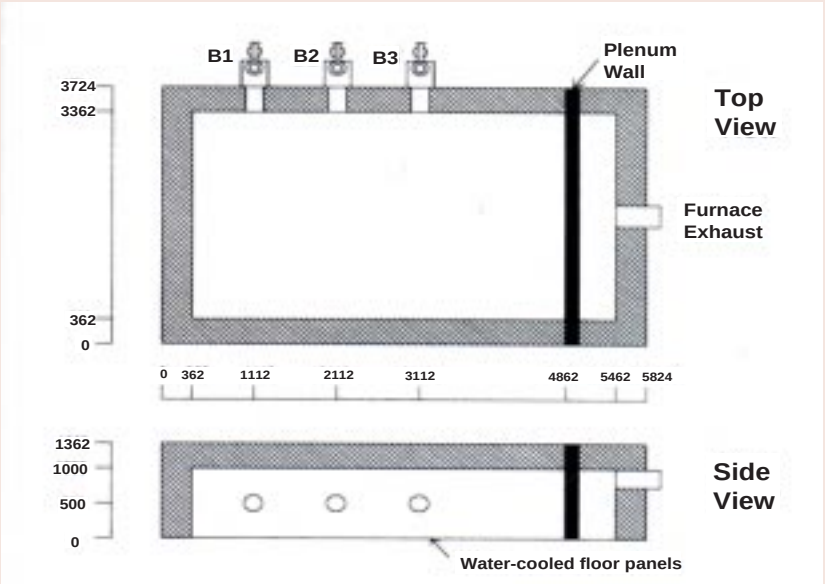
Applications

This O_2-enriched furnace system can be installed in most areas of the steelmaking plant where natural gas is burned including reheat and blast furnaces.

An O_2-Enriched Furnace System Improves the Energy Efficiency and Reduces the Emissions of CO_2 and NO_x

The most recent approach to reducing NO_x emissions and increasing combustion efficiency involves the use of oxygen-enriched air. In combustion systems, atmospheric nitrogen is the source of almost all NO_x emissions. Therefore, if the amount of nitrogen present in burners is lowered, then the amount of NO_x emissions is reduced. At the same time, higher flame temperatures are realized resulting in improved energy efficiency. In oxygen-enriched systems, care must be taken to balance the more rapid NO_x kinetics with the reduced N_2 content in the oxidizing stream. In practice, an intermediate level of N_2 reduction in the oxidizing stream is usually sufficient to reduce NO_x emissions. An added benefit of this technology is that lower fuel requirements produce fewer CO_2 emissions.

Center for Advanced Gas Combustion Technology Research Furnace



Schematic diagram of the Center for Advanced Gas Combustion Technology research furnace showing location of burners (B1 - B3) and primary dimensions (in millimeters).

Project Description

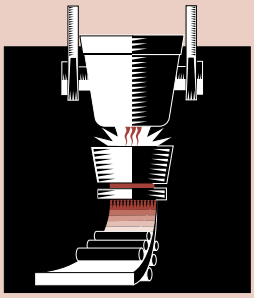
Goal: The Center for Advance Gas Combustion Technology (CAGCT) and the Canadian Gas Research Institute (CGRI) have developed an ultra-low NOx burner for use with natural gas and air. This burner design has been tested under a wide range of operating conditions in the research furnace fired with air and natural gas.

The goals of the project include:

- determining the optimum design for CGRI-type burners with O_2-enriched combustion;
- determining the distribution of heat fluxes to a simulated furnace load (floor panels);
- developing rules-of-thumb, or empirical correlations that relate operating conditions such as firing rate and enrichment level to NOx and CO_2 production;
- demonstrating the effectiveness of O_2-enriched combustion as a cost-effective technique for reducing NOx and CO_2 emissions;
- evaluating the effect of air infiltration on O_2-enriched combustion using a CGRI-type burner;
- developing rules-of-thumb that will predict the effect of air infiltration on NOx emissions;
- measurements of the rate of scaling of steel billets under various operating conditions with O_2-enriched combustion; and,
- recommendations for the optimum operating conditions that minimize scaling while maintaining low NOx and high combustion efficiency.

Progress and Milestones

- Project start date, January 2000.
- CAGCT furnace has been equipped with a new control system and oxygen supply train for O_2-enriched combustion studies.
- Furnace trials have been performed over a complete range of O_2-enrichment levels (zero-to-100 percent)
- Emission rates of NO_X /CO_2 and firing rate have been monitored as indicators of furnace performance.
- Variables examined include the effect of burner geometry, heat transfer load, stack O_2 concentration and the effect of air infiltration.
- Tests for steel scaling at selected operating conditions have been completed as part of the furnace trials.
- Final report is in preparation for this project.
- Project completion date, January 2001.



Project Partners

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(Project Manager)

Air Liquide
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